**CSCI 1301 Lecture 1**

Key points of this lecture:  
1- Overview of computer processing.  
2- Fundamental terminology.  
3- Key pieces of a computer system.  
  
A computer system is made of hardware and software. The hardware components of a computer system are the physical tangible parts of the computer. Hardware includes: chips, box, wires, keyboard, speakers, motherboard, disks, memory card, printer, mouse or mice, monitor, etc. If you can touch it and it can be considered as part of the computer system, then it is a hardware piece.   
  
Hardware components are useless without instructions to tell it what to do. A computer program is a set of instructions telling the computer what to do. Software consists of programs and the data those programs use. Software is the intangible counterpart to the physical hardware components of the computer.  
  
The Key hardware components in a computer system are:  
1- Central Processing Unit (CPU)  
2- Input/output devices (I/O)  
3- Main memory (RAM stores software while in use or processed by CPU)  
4- Secondary memory (the permanent storage of software) the most important secondary memory is the hard disk that resides inside the main computer box.  
  
Software Categories: mainly software can be categorized as either application programs or system programs. The Operating Systems of a computer is a system program. It is to create the interface between user and the compute. Operating system also manages the computer resources such as CPU and memory.  
  
Application software, we can say, it is any software other than the OS.  
  
Digital Computers:  
Two fundamental techniques to store and manage information: analog and digital. Analog information is continuous and in direct proportion to the source of information. Sound waves stored as electronic waves is a good example. Alcohol thermometer is another example.  
  
Digital information breaks the information into pieces and represents them in numbers (this is where the term digital came from). Music on CD is stored digitally.  
Digital cameras are good implementation of digitizing information.  
  
Digital computers store information using binary system and information stored in binary values. Decimal system has numbers from 0 to 9 to form 10 digits. The binary number system has only two digits 0 and 1. A single binary digit is called bit.   
  
All number systems work according to the same rules. The base value of a number system dictates how many digits we have to work with and indicates the place value of each digit in a number.   
  
The decimal number system is base 10, whereas the binary number system is base 2. Computers use binary system because the devices that store and move information are more reliable and less expensive if they have to present only two possible values. That is the main in not the only reason binary numbers are used with computers. Storage or memory devices are “Magnetic” which uses polarization. Therefore, they are best to represent binary values as 0 or 1. 1 represents magnetized area and 0 represents demagnetized area.   
  
A single bit has only two possible values a zero, 0, or one, 1.  
2 bits has two digits or zeros and/or ones (00, 01, 10, 11). N number of bits to the base 2 can represent 2 ^n or 2 to the power of N number of unique values or items. The Math rule of permutation is followed to calculate number of values represented by certain bits.  
  
1 bit is 2 to the power of 1 = 2  
2 bits is 2 to the power of 2 = 4  
3 bits is 2 to the power of 3 = 8  
4 bits is 2 to the power of 4 = 16  
5 bits is 2 to the power of 5 = 32  
6 bits is 2 to the power of 6 = 64  
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Computer architecture is the description of how the computer’s components or hardware are placed or put together. The CPU and the main memory make up the core of the computer. The main memory stores the program and its data that are in active use and the CPU methodically executes program instructions one at a time. All other computer hardware are called or considered peripherals. Controllers are devices that coordinate the activities of the peripherals.  
  
Main memory stores information in bytes format. 8 bits make one byte. If the memory location (one byte) can’t store a large number, a consecutive memory locations or bytes are used to store the data. The storage capacity of the main memory is the number of bytes it can hold.  
Byte = 2 to the power of 1 = 2  
Kilobyte is 2 to the power of 10 = 1024  
Megabyte is 2 to the power of 20 = 1,048,576  
Gigabyte is 2 to the power of 30  
Terabyte is 2 to the power of 40  
Petabyte is 2 to the power of 50  
  
Main memory is volatile, meaning information will be lost when power is turned off. This is why we need to save our work while we are using a certain program. Secondary memory is nonvolatile.   
  
The CPU uses the cache to minimize the average access time to data and program instructions. The cache is a fast small memory that stores the contents of the most frequently used main memory locations. CPU uses fetch-decode-execute cycle for the computer processing. Another component of the CPU is the clock. The clock generates electronic pulse at regular interval, which synchronize the events of the CPU. Processor of 3 GHz means 3 billion pulses per second. The speed of the system clock provides a rough measure of how fast the CPU executes instructions.  
  
  
Now, what are the specifications below for a personal computer mean?  
– 3.07 GHz Intel Core i7 processor  
– 4 GB RAM  
– 750 GB Hard Disk  
– 16x Blu-ray / HD DVD-ROM & 16x DVD+R DVD Burner  
– 17” Flat Screen Video Display with 1280 x 1024 resolution  
– Network Card